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XXXIII.—*On the Microscopic Structure of the Shell of Rhynchonella Geinitziana.* By WILLIAM B. CARPENTER, M.D., F.R.S., F.L.S., F.G.S.

IN consequence of my prolonged absence on the Continent, it has been only within the last few days that I have seen Prof. King's "Remarks on the Histology of *Rhynchopora Geinitziana*," contained in the Ann. Nat. Hist. for last August (p. 124). These remarks have led me to subject my preparations of that shell to a renewed microscopic examination, of which I have now to state the results. Before doing so, however, I may say that I have done my best to dismiss from my mind any prejudice in favour of that view of its structure which I might be supposed to derive from the conclusion to which I had been led by my previous researches—that whilst the *perforation* of the shell by canals passing from surface to surface is the family character of the *Terebratulidæ*, the *absence* of such perforation is the family character of the *Rhynchonellidæ*. The progress of natural-history inquiry is continually bringing to light examples in which features essentially characterizing one group appear in particular types belonging to another. Thus, a paper "On Rose-spored Mushrooms," by Mr. Berkeley, now lying before me, commences as follows:—"I have already pointed out that a single species with decidedly rose-coloured spores (*Agaricus euosmos*) occurs in the white-spored series; but its affinities with the common Oyster-Mushroom (*A. ostreatus*) are so intimate that it would be in direct opposition to nature to separate them." It would not in the least surprise me, therefore, to meet with a perforated Rhynchonellid; and I can honestly say that no *wish* to make out *Rhynchonella Geinitziana* imperforate is father to the *belief* that, as regards its outer layer, it really is so.

The preparations in my possession consist (1) of transparent lamellæ, sealed off from the exposed surface of German and

Russian specimens of the fossil shell in question, and therefore passing, more or less exactly, in a direction *parallel* to that surface; and (2) of a transparent *vertical* section of a German specimen. As these specimens were supplied to me by Mr. Davidson, there can be no doubt of their authenticity.

Some of the transparent lamellæ exhibit distinct and regular perforations, filled with black matter, of considerable size; and had these lamellæ been my sole materials of judgment, I should have readily accorded with the description of Prof. King. But, as I stated when the matter was formerly under discussion (Ann. Nat. Hist. March 1857, p. 214), this appearance is presented only by lamellæ taken from abraded surfaces, and therefore belonging to the *internal* layer of the shell. In a transparent fragment in which the *natural surface* of the shell is partially preserved, the large and regular black spots are seen only near one edge; towards the middle they give place to small black dots, so irregular in size and form as scarcely to be distinguishable from others which are obviously due to infiltrating deposit; and towards the other side they are wanting altogether. Now in the whole of this specimen the characteristic structure of the shell is most perfectly preserved, so that the absence of the marks of perforation cannot be ascribed to metamorphic action.

The key to this variety in the appearances presented by parallel lamellæ is afforded by the *vertical* section. In one part (a) of this section there is an obvious deficiency of the external layer of the shell, and the perforations are seen to pass continuously through the remaining internal



Vertical section of a portion of the shell of
Rhynchopora Geinitziana.

layer. But in another part (b c), the external layer is preserved in great part, if not the whole, of its thickness; and *this layer is plainly seen not to be perforated at all*, the passages all stopping short of it, sometimes ending abruptly in rounded terminations (b), sometimes more pointedly (c c'). Hence it is obvious that if the plane of a *parallel* section pass along the line d e, it will show at a large perforations, at c small perforations, and at b c' none at all, which is exactly what is seen in the specimen previously described. And further, as the transparency of the shell allows the large black spots with which the inner layer is regularly marked to be plainly seen through the outer layer, even when this is perfectly preserved, it is easy to understand how readily the conclusion might be drawn from incomplete observation, that the perforations extend through the whole thickness

of the shell,—a conclusion which I have shown to be negated by the decisive test of a vertical section.

I feel myself justified, therefore, in reiterating my former statement, that the passages which are visible in the shell of *Rhynchonella Geinitziana* traverse the internal layer only, and are therefore of the nature of *pits*, having no physiological relationship with the *canals* which traverse the whole thickness of the shell of the typical *Terebratulidae*, and which open out in large trumpet-shaped orifices on its external surface, although presenting such a rudimental approximation to that structure—as might almost be expected in some member of the imperforate series.

The readers of the ‘Annals’ have now both sides of the case fully before them, and can form their own judgment whether it is more likely that Prof. King or that I have fallen into a “serious mistake” in this matter. But I must ask them to bear in mind that Prof. King’s observations upon this shell have been made, by his own showing, only with a Stanhope lens, upon the exposed *surfaces* of his specimens; whilst mine have been made with a Binocular microscope and a magnifying-power of 120 diameters, upon *transparent lamellæ and sections*. Further, I would recall to their recollection that it was by surface-observation with the Stanhope lens that Prof. King was formerly led to commit himself to the conclusion that all Brachiopod shells are perforated; from which conclusion, if true, it would necessarily follow that the elaborate drawings and descriptions which I had given (in the Reports of the British Association for 1844), of the microscopic structure of the non-perforated forms, had no prototypes in nature*.

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* So far from having ever expressed his regret for this grave imputation, of the fallacy of which he has had ample opportunity of convincing himself, Prof. King has recently pursued the very same course, in asserting that *Eozoon Canadense* is not a fossil, but is a product of chemical and physical agencies. For, if this be true, it necessarily follows, either (1) that my description of its Foraminiferal characters has no foundation in fact, or (2) that I am incompetent to pronounce upon what I assert to be indubitable Foraminiferal structure. As he has not adduced one single fact to justify either of these charges, I have felt myself called upon to repudiate *in toto* his claim to authority in this matter. Whether, under such circumstances, the charge of “personality” is to be laid at my door or at Prof. King’s, I leave it to others to decide. Although he may have used no hard words, the imputations conveyed by his assertions would, if true, be more damaging to my personal as well as to my scientific character than any epithets he could employ.